Invertebrate Fauna in Ballast Water Collected in Vessels Arriving in British Columbia Ports, Especially Those From the Western North Pacific

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INVERTEBRATE FAUNA IN BALLAST WATER COLLECTED IN VESSELS ARRIVING IN BRITISH COLUMBIA PORTS, ESPECIALLY THOSE FROM THE WESTERN NORTH PACIFIC

by

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ABSTRACT

Piercey, G.E., C.D. Levings, M. Elfert, M. Galbraith, and R. Waters. 2000. Invertebrate fauna in ballast water collected in vessels arriving in British Columbia ports, especially those from the western North Pacific. Can. Data Rep. Fish. Aquat. Sci. 1060: 50 pp.

Data are presented on the invertebrate fauna identified from the ballast water of 63 vessels arriving at five British Columbia ports between December, 1995, and January, 1997. Those arriving from the western North Pacific were of particular interest. In total, 352 vessels were boarded and appropriate ship personnel were interviewed. Those vessels with ballast water from various locations in the western North Pacific were sampled if permission from the vessel's representative was obtained. Information on ballast capacity, ballast on board, and other pertinent information has been summarized for all vessels, where available. Temperature and salinity data were obtained at the same time as the biological samples were collected.

RÉSUMÉ

Piercey, G.E., C.D. Levings, M. Elfert, M. Galbraith, and R. Waters. 2000. Invertebrate fauna in ballast water collected in vessels arriving in British Columbia ports, especially those from the western North Pacific. Can. Data Rep. Fish. Aquat. Sci. 1060: 50 pp.

Nous présentons des données sur la faune invertébrée identifié dans l'eau de lest de 63 navires qui ont accosté à cinq ports de Colombie-Britannique entre décembre 1995 et janvier 1997. Les navires qui venaient de l'ouest du Pacifique Nord ont particulièrement retenu notre attention. Au total, 352 bâtiments ont été visités, et les membres d'équipage compétents ont été interrogés. Nous avons effectué des prélèvements d'eau de lest provenant de divers endroits du Pacifique Nord lorsque la permission nous était accordée par le responsable du navire. Nous avons également, quand c'était possible, obtenu des renseignements sur la capacité des ballasts et la présence d'eau de les à bord, ainsi que d'autres informations pertinentes. Les données sur la tempéraure et la salinité one été recueillies au moment du prélèvement des échantillons biologiques.

INTRODUCTION

In an attempt to document the potential for introduction of non-indigenous invertebrate species entering British Columbia water in the ballast of freighters, a sampling program was conducted between 1995 and 1997. Personnel from vessels docking at British Columbia ports, with an emphasis on Vancouver, were interviewed and ballast water origin was ascertained. Those vessels with ballast originating in the northwest Pacific received requests for biological sampling. Preliminary analyses of the biological data were presented in Levings et al. (1998). Here we present the raw data used in those analyses.

METHODS

Vessels in port at Vancouver, New Westminster, Crofton, Nanaimo, and Prince Rupert were approached between December, 1995, and January, 1997. With the aid of a standard pre-printed form (Table 1), each Master or his representative was interviewed and a request for access was made if the origin of the ballast water was appropriate and safety and timing conditions were met.

Ballast water was sampled by pumping approximately 500 L with a portable electric diaphram pump from access standpipes and other sounding ports. Conditions which precluded sampling 500 L included: the ballast was too low in the tank to pump a sufficient volume, equipment malfunction, no access to the ballast, safety issues, or timing. The intake hose was lowered about 7.5 m into an access standpipe. The resulting sample was filtered through a 44-μm mesh net set on a frame on the deck of the vessel. The material was washed off the net and preserved in a 5% formalin solution in which Rose Bengal had been added. An additional 15-ml sample was returned to the lab for later salinity determination with an Argent temperature compensating salinity refractometer. Temperature was obtained from the sample with a hand-held thermometer as it was being pumped.

On two occasions, vessels were sampled by lowering a 44-μm plankton net and obtaining a vertical tow sample from the ballast tank.

In the laboratory the sample was sieved through a 37-μm mesh. Using a dissecting microscope (Wild M-3Z), invertebrates were identified to order or class, removed, and preserved in a 50% isopropanol solution for later identification. Calanoid and cyclopoid copepods were identified further to the genus or species level; some harpacticoid copepods were also identified to the genus or species level.

RESULTS

Three hundred fifty-two vessels were approached and interviewed (Table 2) between December, 1995 and January, 1997. At Vancouver ports, 298 vessels were approached and interviewed, with an additional 9 at New Westminster, 19 at Prince Rupert, 12 at Nanaimo, and 14 at Crofton. Sixty-seven samples were obtained from 63 vessels. On three occasions, ballast water was taken from more than one ballast tank on a vessel.

Volumes sampled by diaphram pump averaged 436 L per vessel (range 35-550 L). Salinities from all samples averaged 31.9 psu (range 1-37), and temperatures averaged 11.7 C (range 4-25.5) (Table 3).

Twenty-five of the vessels sampled had ballast water originating in Japan, 13 were from a mixture of Japan and mid-Pacific, 8 were from the west coast of the U.S.A., and 4 were from South Korea. The remainder were from a variety of Asian and northeast Pacific sources and mixtures (Table 3).

Tables 3 and 4 have been standardized to present number of organisms per 1000 L. The standardized number of organisms averaged 1143•1000 L^{-1} (range 0-12,932•1000 L^{-1}). Samples #2A and #12 were sampled by plankton net; the total number per tow rather than number per 1000 L is presented in Tables 3 and 4. For sample #22, there was an error in sub-sampling the copepods, so data in Table 4 are presented as presence/absence only. Due to the large diversity of taxa, Table 3 presents identifications to the order or class level, and Table 4 presents the copepod identifications to genus or species.

Of the 352 vessels boarded, 167 (42%) had ballast originating in the mid-Pacific Ocean, 58 (16%) from northeast Asia, 31 (9%) reported having no ballast, with the remainder comprising ballast from a variety of other sources and mixtures (Table 5). From a seasonal perspective, 111 (32%) of the vessels were boarded from January to March, 1996, 96 (27%) from October to December, 1996, and 83 (24%) from July to September, 1996 (Table 5).

Ballast capacity of the vessels that were boarded and for which questionnaires were completed varied widely (26-200,000 metric tonnes (MT)), with an average of approximately 19,000 MT per vessel. Table 6 presents data on the ballast capacity by season of vessels entering the ports. Due to incomplete information provided by vessel representatives, no data on actual volumes of ballast water are given.

Transit times of vessels from their last port of call to British Columbia ports are presented in Table 7, and ranged from 4 to 47 days, and for the most part represents distance travelled. The last port of call is not in all cases indicative of ballast water origin, as some vessels took on ballast water prior to their last port of call or exchanged at sea.

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REFERENCE

Levings, C.D., G.E. Piercey, M. Galbraith, and G.S. Jamieson. 1998. Analyses of invertebrate fauna in ballast water collected in ships arriving at British Columbia ports, especially those from the western North Pacific. *In* Proceedings of Eighth International Zebra Mussel and Aquatic Nuisance Species Conference, Pembroke, Ontario, March 16 to 19, 1998. pp. 111-124.

Table 1. Interview questionnaire used to determine ballast water origin.

Department of Fisheries and Oceans
BALLAST WATER SAMPLING PROGRAM 1996
Questionnaire

Port: _____ Sampler: _____ Date: _____

Name of Vessel: _____ Registry: _____

Vessel Type/Cargo: _____ Date of Arrival: _____

Vessel Contact Name and Title: _____

Last Port-Of Call: _____ Date Departure from Last Port: _____

Ballast Capacity (MT): _____

Ballast on Board (MT): _____ Origin of Ballast Sampled (Country, City): _____

Amount of Ballast Released before Port (MT): _____

Location Ballast was Released (area, lat/long, etc.): _____

Comments on Ballast: _____
_____

	Tank Location	Access Point	Temp (c)	Salinity (‰)	Plankton (✓)	Sediment (✓)	Time (h)	Volume Sampled
1								
2								
3								

Tank locations are fore peak, aft peak, double bottom, wing tanks, side tanks, deep tanks or cargo holds.

Access point are stand pipes, manholes, open cargo holds or ballast pump tap.

Comments: (such as equipment used, etc.)

Table 2. Vessels boarded to determine ballast water origin, December, 1995, to January, 1997. (**NAN** = Nanaimo area; **PR** = Prince Rupert area; **VAN** = Vancouver area; **ns** = no sample obtained; **BALLAST ORIGIN** = information from vessel Master; **BALLAST REGION CODE** = general geographic category used in biological analyses (Levings et al. 1998)).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
NAN01	19960110	Nanaimo Assembly	unknown	unknown	ns
NAN02	19960119	Nanaimo Assembly	mid-Pacific	mid-Pac	**3**
NAN03	19960123	Duke Point	mid-Pacific	mid-Pac	**4**
NAN04	19960126	Crofton	B.C.	BC	ns
NAN05	19960127	Nanaimo Assembly	S. Korea	NE Asia	**7**
NAN06	19960205	Crofton	S. Korea/Japan	NE Asia	**8**
NAN07	19960212	Nanaimo Assembly	mid-Pacific	mid-Pac	ns
NAN08	19960216	Crofton	B.C./U.S.A.	US West/BC	ns
NAN09	19960217	Nanaimo Assembly	Vancouver	BC	ns
NAN10	19960220	Crofton	Columbia R.	US West	ns
NAN11	19960224	Crofton	B.C.	BC	ns
NAN12	19960228	Crofton	empty	no ballast	ns
NAN13	19960229	Crofton	California	US West	**13**
NAN14	19960304	Nanaimo Assembly	B.C.	BC	ns
NAN15	19960308	Crofton	B.C.	BC	ns
NAN16	19960311	Nanaimo Assembly	B.C.	BC	ns
NAN17	19960312	Crofton	empty	no ballast	ns
NAN18	19960312	Crofton	B.C.	BC	ns
NAN19	19960315	Crofton	empty	no ballast	ns
NAN20	19960328	Crofton	B.C.	BC	ns
NAN21	19960315	Crofton	Japan	NE Asia	**19**
NAN22	19960328	Nanaimo Assembly	mid-Pacific	mid-Pac	ns
NAN23	19960328	Crofton	S. Korea	NE Asia	ns
NAN24	19960406	Nanaimo Assembly	B.C.	BC	ns
NAN25	19960406	Nanaimo Assembly	B.C.	BC	ns
NAN26	19960406	Nanaimo Assembly	B.C.	BC	ns
PR01	19960306	Prince Rupert Grain	mid-Pacific	mid-Pac	ns
PR02	19960306	anchor	Japan	NE Asia	**20**
PR03	19960307	Fairview	mid-Pacific	mid-Pac	ns
PR04	19960307	anchor	mid-Pacific	mid-Pac	ns
PR05	19960307	Fairview	mid-Pacific	mid-Pac	ns
PR06	19960307	Coal Terminal	mid-Pacific	mid-Pac	ns
PR07	19960311	anchor	mid-Pacific	mid-Pac	ns
PR08	19960313	Watson Is.	Japan	NE Asia	**21**
PR09	19960315	Prince Rupert Grain	mid-Pacific	mid-Pac	ns
PR10	19960315	Coal Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	ns
PR11	19960315	anchor	mid-Pacific	mid-Pac	ns
PR12	19960315	anchor	mid-Pacific	mid-Pac	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
PR13	19960327	Watson Is.	mid-Pacific	mid-Pac	ns
PR14	19960327	Ridley Is.	mid-Pacific	mid-Pac	ns
PR15	19960328	Fairview	Japan/Korea	NE Asia	22
PR16	19960328	Watson Is.	Japan/mid-Pacific	NE Asia/mid-Pac	23
PR17	19960329	Fairview	B.C.	BC	ns
PR18	19960423	Rupert	Columbia R.	US West	ns
PR19	19960424	Ridley Is.	Kitimat	BC	ns
VAN01	19951229	Alberta Wheat Pool	Japan	NE Asia	1
VAN02	19960119	United Grain Growers	China	SE Asia	2
VAN03	19960125	Casco Terminals	unknown	unknown	ns
VAN04	19960125	Vancouver Terminal	Los Angeles	US West	ns
VAN05	19960125	Vancouver Terminal	empty	no ballast	ns
VAN06	19960126	Pacific Elevators	Los Angeles	US West	5
VAN07	19960126	Vancouver Terminal	S. America	S Amer	ns
VAN08	19960126	Neptune Bulk Terminals	empty	no ballast	ns
VAN09	19960126	Pioneer Grain Terminal	unknown	unknown	ns
VAN10	19960126	Saskatchewan Wheat Pool	unknown	unknown	ns
VAN11	19960126	Neptune Bulk Terminals	empty	no ballast	ns
VAN12	19960126	United Grain Growers	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN13	19960126	Vancouver Terminal	Los Angeles	US West	ns
VAN14	19960127	Fraser Surrey Docks	Japan/mid-Pacific	NE Asia/mid-Pac	6
VAN15	19960208	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN16	19960208	Vancouver Terminal	unknown	unknown	ns
VAN17	19960208	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN18	19960209	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN19	19960209	LynnTerm	Asia/mid-Pacific	Asia/mid-Pac	ns
VAN20	19960209	LynnTerm	mid-Pacific	mid-Pac	ns
VAN21	19960209	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN22	19960209	Seaboard Int. Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN23	19960220	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN24	19960220	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN25	19960221	Pacific	mid-Pacific	mid-Pac	ns
VAN26	19960221	Alberta Wheat Pool	empty	no ballast	ns
VAN27	19960221	Pacific	unknown	unknown	ns
VAN28	19960221	LynnTerm	S.Korea/mid-Pacific	NE Asia/mid-Pac	9
VAN29	19960222	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN30	19960222	LynnTerm	Japan	NE Asia	ns
VAN31	19960222	LynnTerm	Prince Rupert	BC	ns
VAN32	19960223	Fraser Surrey Docks	Japan	NE Asia	ns
VAN33	19960223	Vancouver Wharves	empty	no ballast	ns
VAN34	19960223	Vancouver Wharves	Taiwan	NE Asia	ns
VAN35	19960223	Vancouver Wharves	empty	no ballast	ns
VAN36	19960223	Vancouver Wharves	mid-Pacific	mid-Pac	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN37	19960306	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN38	19960306	Vancouver Terminal	mid-Pacific	mid-Pac	ns
VAN39	19960306	Pacific Elevators	Hawaii	mid-Pac	10
VAN40	19960307	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN41	19960307	Vancouver Wharves	Los Angeles	US West	12
VAN42	19960307	Vancouver Wharves	Japan	NE Asia	11
VAN43	19960312	LynnTerm	Japan	NE Asia	ns
VAN44	19960312	LynnTerm	Japan	NE Asia	ns
VAN45	19960313	United Grain Growers	Japan	NE Asia	14
VAN46	19960313	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN47	19960313	Pacific	empty	no ballast	ns
VAN48	19960313	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN49	19960314	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN50	19960314	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN51	19960314	United Grain Growers	Japan/mid-Pacific	NE Asia/mid-Pac	15
VAN52	19960321	Fraser Surrey Docks	Japan	NE Asia	16
VAN53	19960325	United Grain Growers	empty	no ballast	ns
VAN54	19960325	Vancouver Terminal	mid-Pacific	mid-Pac	ns
VAN55	19960325	Can Occ	empty	no ballast	ns
VAN56	19960326	Fraser Surrey Docks	Japan	NE Asia	ns
VAN57	19960326	Fraser Surrey Docks	Columbia R.	US West	ns
VAN58	19960326	Fraser Surrey Docks	Europe	Europe	ns
VAN59	19960326	United Grain Growers	Kamtchatka/mid-Pac	NE Asia/mid-Pac	ns
VAN60	19960326	Alberta Wheat Pool	Korea	NE Asia	ns
VAN61	19960326	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN62	19960326	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN63	19960327	Neptune Bulk Terminals	Japan	NE Asia	17
VAN64	19960327	Pioneer Grain Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN65	19960327	LynnTerm	mid-Pacific	mid-Pac	ns
VAN66	19960327	LynnTerm	empty	no ballast	ns
VAN67	19960328	Pioneer Grain Terminal	Mexico/mid-Pacific	mid-Pac	18
VAN68	19960328	Vancouver Terminal	mid-Pacific	mid-Pac	ns
VAN69	19960329	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN70	19960329	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN71	19960505	Fraser Surrey Docks	Japan	NE Asia	24
VAN72	19960508	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN73	19960508	Alberta Wheat Pool	Japan	NE Asia	25
VAN74	19960508	Vancouver Terminal	mid-Pacific	mid-Pac	ns
VAN75	19960508	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN76	19960515	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN77	19960515	LynnTerm	Japan	NE Asia	ns
VAN78	19960515	Alberta Wheat Pool	Japan	NE Asia	ns
VAN79	19960515	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN80	19960515	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN81	19960515	Neptune Bulk Terminals	empty	no ballast	ns
VAN82	19960517	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN83	19960517	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN84	19960521	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN85	19960523	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN86	19960523	Vancouver Terminal	mid-Pacific	mid-Pac	ns
VAN87	19960523	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN88	19960523	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN89	19960523	Saskatchewan Wheat Pool	California	US West	26
VAN90	19960524	United Grain Growers	China/mid-Pacific	SE Asia/mid-Pac	27
VAN91	19960610	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN92	19960612	Saskatchewan Wheat Pool	Japan	NE Asia	28
VAN93	19960613	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN94	19960613	Neptune Bulk Terminals	Japan	NE Asia	29
VAN95	19960614	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN96	19960614	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN97	19960618	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN98	19960619	Fraser Surrey Docks	Japan	NE Asia	30
VAN99	19960619	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN100	19960621	Westshore Terminals	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN101	19960621	Westshore Terminals	S. Korea/mid-Pacific	NE Asia/mid-Pac	ns
VAN102	19960621	Alberta Wheat Pool	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN103	19960626	United Grain Growers	Japan/mid-Pacific	NE Asia/mid-Pac	31
VAN104	19960627	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN105	19960627	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN106	19960627	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN107	19960709	Alberta Wheat Pool	S. Korea	NE Asia	ns
VAN108	19960709	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN109	19960709	Neptune Bulk Terminals	S. Korea	NE Asia	36
VAN110	19960712	United Grain Growers	Columbia R.	US West	ns
VAN111	19960715	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN112	19960715	Westshore Terminals	Japan	NE Asia	32
VAN113	19960715	Fraser Surrey Docks	Japan	NE Asia	ns
VAN114	19960716	Vancouver Terminal	mid-Pacific	mid-Pac	ns
VAN115	19960716	Vancouver Terminal	S. Korea	NE Asia	33
VAN116	19960716	Neptune Bulk Terminals	Japan	NE Asia	34
VAN117	19960726	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN118	19960726	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN119	19960729	Vancouver Wharves	Japan	NE Asia	35
VAN120	19960730	Vancouver Terminal	Japan/Thailand	NE Asia/SE Asia	ns
VAN121	19960730	Vancouver Terminal	Shanghai/Long Beach	SE Asia/US West	ns
VAN122	19960730	Vancouver Terminal	Guatemala	S Amer	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN123	19960730	Vancouver Terminal	Washington	US West	ns
VAN124	19960806	Vancouver Wharves	empty	no ballast	ns
VAN125	19960806	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN126	19960806	Neptune Bulk Terminals	Oregon	US West	ns
VAN127	19960809	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN128	19960809	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN129	19960809	Neptune Bulk Terminals	California	US West	ns
VAN130	19960809	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN131	19960812	Neptune Bulk Terminals	empty	no ballast	ns
VAN132	19960812	Pacific Coast Terminals	empty	no ballast	ns
VAN133	19960812	Seaboard Int. Terminal	mid-Pacific	mid-Pac	ns
VAN134	19960812	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN135	19960812	Pacific Coast Terminals	Los Angeles	US West	37
VAN136	19960813	Seaboard Int. Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	38
VAN137	19960813	Alberta Wheat Pool	Japan	NE Asia	39
VAN138	19960814	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN139	19960814	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN140	19960814	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN141	19960822	Neptune Bulk Terminals	Oregon	US West	40
VAN142	19960826	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN143	19960827	Alberta Wheat Pool	Japan/mid-Pacific	NE Asia/mid-Pac	41
VAN144	19960828	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN145	19960828	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN146	19960828	Vancouver Wharves	Japan/mid-Pacific	NE Asia/mid-Pac	42
VAN147	19960828	Saskatchewan Wheat Pool	Oregon	US West	43
VAN148	19960831	United Grain Growers	California	US West	ns
VAN149	19960831	Saskatchewan Wheat Pool	Japan	NE Asia	ns
VAN150	19960831	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN151	19960906	Vancouver Wharves	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN152	19960906	Neptune Bulk Terminals	Japan	NE Asia	44
VAN153	19960909	LynnTerm	Washington	US West	ns
VAN154	19960909	LynnTerm	mid-Pacific	mid-Pac	ns
VAN155	19960909	Alberta Wheat Pool	Washington	US West	ns
VAN156	19960909	Seaboard Int. Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	45
VAN157	19960910	Saskatchewan Wheat Pool	Washington	US West	ns
VAN158	19960910	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN159	19960910	Vancouver Wharves	Japan/Korea/Taiwan	NE Asia	46
VAN160	19960910	Pioneer Grain Terminal	Japan	NE Asia	47
VAN161	19960911	LynnTerm	Korea/Japan	NE Asia	ns
VAN162	19960911	Neptune Bulk Terminals	Japan	NE Asia	ns
VAN163	19960911	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN164	19960911	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN165	19960911	Pacific Elevators	Japan	NE Asia	48

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN166	19960911	Vancouver Wharves	Japan	NE Asia	49
VAN167	19960912	Pacific Elevators	Japan/mid-Pacific	NE Asia/mid-Pac	50
VAN168	19960913	United Grain Growers	China	SE Asia	51
VAN169	19960916	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN170	19960916	Seaboard Int. Terminal	mid-Pacific	mid-Pac	ns
VAN171	19960916	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN172	19960916	Pacific Coast Terminals	empty	no ballast	ns
VAN173	19960917	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN174	19960917	LynnTerm	Japan	NE Asia	ns
VAN175	19960917	LynnTerm	mid-Pacific	mid-Pac	ns
VAN176	19960917	LynnTerm	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN177	19960917	Pacific Coast Terminals	empty	no ballast	ns
VAN178	19960917	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN179	19960918	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN180	19960918	Vancouver Wharves	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN181	19960918	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN182	19960918	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN183	19960918	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN184	19960918	Pioneer Grain Terminal	San Francisco	US West	52
VAN185	19960919	United Grain Growers	Juan de Fuca	US West	ns
VAN186	19960926	Seaboard Int. Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	53
VAN187	19960926	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN188	19960926	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN189	19960926	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN190	19961001	Pacific Elevators	Japan/mid-Pacific	NE Asia/mid-Pac	54
VAN191	19961001	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN192	19961001	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN193	19961001	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN194	19961007	LynnTerm	mid-Pacific	mid-Pac	ns
VAN195	19961007	LynnTerm	Japan	NE Asia	ns
VAN196	19961007	LynnTerm	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN197	19961007	LynnTerm	California	US West	ns
VAN198	19961007	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN199	19961007	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN200	19961007	Pioneer Grain Terminal	unknown	Unknown	ns
VAN201	19961007	Saskatchewan Wheat Pool	empty	no ballast	ns
VAN202	19961008	Vancouver Wharves	Alaska	mid-Pac	ns
VAN203	19961008	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN204	19961008	Neptune Bulk Terminals	Vancouver	BC	ns
VAN205	19961008	Seaboard Int. Terminal	mid-Pacific	mid-Pac	ns
VAN206	19961008	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN207	19961009	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN208	19961009	Vancouver Wharves	empty	no ballast	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN209	19961016	Saskatchewan Wheat Pool	Shanghai	SE Asia	ns
VAN210	19961016	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN211	19961016	Pioneer Grain Terminal	Taiwan	NE Asia	ns
VAN212	19961016	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN213	19961021	Seaboard Int. Terminal	Japan/mid-Pacific	NE Asia/mid-Pac	**55**
VAN214	19961021	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN215	19961021	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN216	19961021	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN217	19961022	Vancouver Wharves	empty	no ballast	ns
VAN218	19961022	Vancouver Wharves	Columbia R.	US West	ns
VAN219	19961022	Seaboard Int. Terminal	mid-Pacific	mid-Pac	ns
VAN220	19961022	LynnTerm	mid-Pacific	mid-Pac	ns
VAN221	19961022	LynnTerm	Japan/U.S.A.	NE Asia/US West	ns
VAN222	19961022	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN223	19961022	Saskatchewan Wheat Pool	unknown	Unknown	ns
VAN224	19961023	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN225	19961023	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN226	19961023	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN227	19961023	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN228	19961023	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN229	19961024	Saskatchewan Wheat Pool	mid Pacific	mid-Pac	ns
VAN230	19961029	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN231	19961029	LynnTerm	mid-Pacific	mid-Pac	ns
VAN232	19961029	LynnTerm	mid-Pacific	mid-Pac	ns
VAN233	19961029	LynnTerm	mid-Pacific	mid-Pac	ns
VAN234	19961029	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN235	19961113	Vancouver Wharves	Japan/mid-Pacific	NE Asia/mid-Pac	**56**
VAN236	19961113	Vancouver Wharves	empty	no ballast	ns
VAN237	19961113	Saskatchewan Wheat Pool	empty	no ballast	ns
VAN238	19961113	Seaboard Int. Terminal	mid-Pacific	mid-Pac	ns
VAN239	19961113	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN240	19961113	Neptune Bulk Terminals	empty	no ballast	ns
VAN241	19961113	Pacific Coast Terminals	empty	no ballast	ns
VAN242	19961113	Seaboard Int. Terminal	Japan	NE Asia	ns
VAN243	19961114	Westshore Terminals	Japan	NE Asia	**57**
VAN244	19961114	LynnTerm	mid-Pacific	mid-Pac	ns
VAN245	19961114	Neptune Bulk Terminals	Tacoma/Plumper	US West/BC	ns
VAN246	19961114	Westshore Terminals	Los Angeles	US West	ns
VAN247	19961115	Alberta Wheat Pool	empty	no ballast	ns
VAN248	19961115	LynnTerm	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN249	19961115	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN250	19961115	Saskatchewan Wheat Pool	empty	no ballast	ns
VAN251	19961115	United Grain Growers	mid-Pacific	mid-Pac	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN252	19961115	Neptune Bulk Terminals	B.C. Coast	BC	ns
VAN253	19961115	Pioneer Grain Terminal	mid-Pacific	mid-Pac	ns
VAN254	19961120	Vancouver Wharves	S. Korea	NE Asia	**58**
VAN255	19961120	Westshore Terminals	Japan/mid-Pacific/BC	NE Asia/mid-Pac/BC	**59**
VAN256	19961120	Pacific Elevators	unknown	Unknown	ns
VAN257	19961120	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN258	19961120	Vancouver Wharves	Japan	NE Asia	ns
VAN259	19961120	Vancouver Wharves	Japan/mid-Pacific	NE Asia/mid-Pac	ns
VAN260	19961120	Vancouver Wharves	unknown	Unknown	ns
VAN261	19961121	Pacific Elevators	Japan	NE Asia	**60**
VAN262	19961121	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN263	19961121	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN264	19961122	LynnTerm	mid-Pacific	mid-Pac	ns
VAN265	19961122	LynnTerm	mid-Pacific	mid-Pac	ns
VAN266	19961122	Alberta Wheat Pool	empty	no ballast	ns
VAN267	19961126	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN268	19961126	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN269	19961126	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN270	19961126	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN271	19961126	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN272	19961128	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN273	19961128	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN274	19961128	Pacific Elevators	S. Korea	NE Asia	ns
VAN275	19961128	Neptune Bulk Terminals	empty	no ballast	ns
VAN276	19961128	LynnTerm	Japan	NE Asia	ns
VAN277	19961128	LynnTerm	mid-Pacific	mid-Pac	ns
VAN278	19961128	LynnTerm	mid-Pacific	mid-Pac	ns
VAN279	19961128	LynnTerm	Bellingham	US West	ns
VAN280	19961129	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN281	19961129	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN282	19961129	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN283	19961129	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN284	19961130	Westshore Terminals	Japan	NE Asia	**61**
VAN285	19961130	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN286	19970107	Vancouver Wharves	Japan	NE Asia	**62**
VAN287	19970108	Vancouver Wharves	S. Korea/mid-Pacific	NE Asia/mid-Pac	**63**
VAN288	19970107	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN289	19970107	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN290	19970107	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN291	19970108	United Grain Growers	mid-Pacific	mid-Pac	ns
VAN292	19970108	Vancouver Wharves	Squamish	BC	ns
VAN293	19970108	Pacific Elevators	mid-Pacific	mid-Pac	ns
VAN294	19970118	LynnTerm	Japan	NE Asia	ns

Table 2 (continued).

Vessel Id.	Date (yyyymmdd)	Dock	Ballast Origin	Ballast Region Code	Biological Sample Number in Table 3
VAN295	19970118	Westshore Terminals	empty	no ballast	ns
VAN296	19970118	Westshore Terminals	mid-Pacific	mid-Pac	ns
VAN297	19970118	LynnTerm	Japan	NE Asia	ns
VAN298	19970120	Ballantyne	mid-Pacific	mid-Pac	ns
VAN299	19970120	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN300	19970120	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN301	19970120	Alberta Wheat Pool	mid-Pacific	mid-Pac	ns
VAN302	19970120	Pacific Coast Terminals	mid-Pacific	mid-Pac	ns
VAN303	19970120	Vancouver Wharves	mid-Pacific	mid-Pac	ns
VAN304	19970121	Saskatchewan Wheat Pool	mid-Pacific	mid-Pac	ns
VAN305	19970121	Neptune Bulk Terminals	mid-Pacific	mid-Pac	ns
VAN306	19970121	Pacific Elevators	S. Korea	NE Asia	ns
VAN307	19970121	Westshore Terminals	California/mid-Pacific	US West/mid-Pac	ns

Table 3. Taxa identified from the ballast water of vessels sampled. Data are number of organisms•1000 L^{-1}, except for samples 2A and 12, which were sampled with plankton net (ns = not sampled).

Sample No.	1A	1B	2A	2B	3
Ballast Origin	Japan	Japan	China	China	mid-Pacific
Salinity (psu)	36	36	26	26	35
Temp (C)	6.7	6.7	7.8	ns	ns
Date Sampled (yyyymmdd)	19951229	19951230	19960119	19960119	19960119
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	0	29	0	10	0
Rotifera	0	0	0	0	0
Polychaeta	0	0	0	0	0
Bivalvia	0	0	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	0	15
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	5
Calanoida	220	29	0	10	25
Cyclopoida	25	29	0	0	0
Harpacticoida	5	0	2	5	5
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	15	0	0	5	0
Crustacean nauplii	0	0	0	0	5
Cyprid	0	0	0	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	5	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	4	5	6	7	8
Ballast Origin	mid-Pacific	Los Angeles	Japan/ mid-Pacific	S. Korea	S. Korea/ Japan
Salinity (psu)	37	36	35	35	35
Temp (C)	7.5	5.2	8.2	4	7.2
Date Sampled (yyyymmdd)	19960123	19960125	19960127	19960127	19960205
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	0	0	0	0	5
Rotifera	0	0	0	0	0
Polychaeta	0	0	170	0	0
Bivalvia	0	10	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	5	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	44	0	0
Copepoda copepodites	0	20	0	0	85
Calanoida	0	22	56	5	40
Cyclopoida	0	146	1604	5	265
Harpacticoida	1497	0	24	0	5
Monstrilloida	0	0	0	0	5
Copepoda - unaccounted	0	14	434	0	15
Crustacean nauplii	0	128	276	5	490
Cyprid	0	0	0	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	6	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	6	0	48	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	9	10	11	12	13A
Ballast Origin	S. Korea/ mid-Pacific	Hawaii	Japan	Los Angeles	California
Salinity (psu)	34	37	35	35	35
Temp (C)	8.1	8.1	8.9	11.5	8
Date Sampled (yyyymmdd)	19960221	19960306	19960307	19960307	19960229
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	4	0	0	0	0
Rotifera	0	0	0	0	0
Polychaeta	6	0	39	0	0
Bivalvia	0	0	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	0	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	2	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	14	84	0	47	100
Cyclopoida	112	4	2390	177	5
Harpacticoida	4	4	468	4	20
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	38	0	26	28	0
Crustacean nauplii	294	24	0	706	5
Cyprid	0	0	0	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	12	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	13B	13C	14	15	16
Ballast Origin	California	California	Japan	Japan/ mid-Pacific	Japan
Salinity (psu)	23	34	35	36	34
Temp (C)	7	8	11.5	9.7	9.8
Date Sampled (yyyymmdd)	19960229	19960220	19960313	19960314	19960321
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	0	5	0	0	10
Rotifera	0	0	0	0	0
Polychaeta	10	0	2	0	2
Bivalvia	0	0	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	0	2
Ostracoda	10	10	0	0	0
Copepoda nauplii	0	10	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	1060	80	130	48	12
Cyclopoida	25	635	784	166	16
Harpacticoida	0	5	670	200	50
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	0	0	0	0
Crustacean nauplii	55	170	18	234	12
Cyprid	0	0	2	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	17	18	19	20	21
Ballast Origin	Japan	Mexico/ mid-Pacific	Japan	Japan	Japan
Salinity (psu)	34	37	35	35	34
Temp (C)	8.5	11.6	9.5	ns	6.4
Date Sampled (yyyymmdd)	19960327	19960328	19960315	19960306	19960313
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	507
Nematoda	0	0	0	0	0
Rotifera	0	0	0	0	0
Polychaeta	0	12	0	0	0
Bivalvia	0	0	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	0	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	0	34	195	100	173
Cyclopoida	0	214	0	0	0
Harpacticoida	2	34	0	0	17
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	462	0	85	20
Crustacean nauplii	0	944	25	4	0
Cyprid	0	0	0	2	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	22	23	24	25	26
Ballast Origin	Japan/ Korea	Japan/ mid-Pacific	Japan	Japan	California
Salinity (psu)	35	34	34	36	36
Temp (C)	ns	ns	9.5	10.3	10.9
Date Sampled (yyyymmdd)	19960328	19960328	19960505	19960508	19960523
Cnidaria (Hydra)	0	0	0	0	0
Medusa	2	4	0	0	0
Nematoda	0	0	0	0	4
Rotifera	0	0	0	0	0
Polychaeta	567	11	12	14	0
Bivalvia	0	9	4	0	0
Gastropoda	0	22	0	0	2
Cladocera	0	0	0	0	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	10	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	2335	831	6490	0	0
Cyclopoida	49	213	744	10	154
Harpacticoida	45	91	920	40	126
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	0	26	14	0
Crustacean nauplii	851	202	152	6	0
Cyprid	31	11	6	0	4
Amphipoda	0	0	0	0	0
Isopoda	0	0	2	0	0
Cumacea	2	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	145	0	0	0	0
Chaetognatha	4	31	10	0	0
Larvacea	0	7	0	0	0

Table 3 (continued).

Sample No.	27	28	29	30	31
Ballast Origin	China/ mid-Pacific	Japan	Japan	Japan	Japan/ mid-Pacific
Salinity (psu)	16	36	35	35	33
Temp (C)	12.4	12.3	16.5	12.7	18.2
Date Sampled (yyyymmdd)	19960524	19960612	19960613	19960619	19960626
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	2	2	0	0	0
Rotifera	0	0	0	0	0
Polychaeta	0	0	0	32	0
Bivalvia	0	0	18	58	0
Gastropoda	0	2	0	4	0
Cladocera	0	0	0	0	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	0	12	4	166	6
Cyclopoida	8	20	2	1342	0
Harpacticoida	8	4	0	26	0
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	0	8	154	0
Crustacean nauplii	0	0	0	28	0
Cyprid	0	2	0	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	0	0
Larvacea	0	0	0	18	0

Table 3 (continued).

Sample No.	32	33	34	35	36
Ballast Origin	Japan	S. Korea	Japan	Japan	S. Korea
Salinity (psu)	35	35	32	32	36
Temp (C)	13.3	18.9	20.3	20.6	13.5
Date Sampled (yyyymmdd)	19960715	19960716	19960716	19960729	19960709
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	0	0	0	0	0
Rotifera	0	0	0	0	0
Polychaeta	0	0	0	0	0
Bivalvia	0	0	2	2	0
Gastropoda	0	0	0	2	0
Cladocera	0	0	0	0	0
Ostracoda	0	0	2	2	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	18	0	1346	54	0
Cyclopoida	0	0	32	10	0
Harpacticoida	0	0	2	0	0
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	2	0	0	0	0
Crustacean nauplii	0	0	0	0	0
Cyprid	0	0	0	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	8	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	16	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	37	38	39	40	41
Ballast Origin	Los Angeles	Japan/ mid-Pacific	Japan	Oregon	Japan/ mid-Pacific
Salinity (psu)	33	34	2	1	35
Temp (C)	15.3	17.6	18.4	20.2	14.2
Date Sampled (yyyymmdd)	19960812	19960813	19960813	19960822	19960827
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	4	0	0	0	0
Rotifera	0	0	0	28	0
Polychaeta	88	1124	18	0	0
Bivalvia	40	0	16	0	0
Gastropoda	6	0	0	0	0
Cladocera	0	0	552	10142	20
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	18	2	0
Copepoda copepodites	94	0	0	0	156
Calanoida	126	22	1634	66	702
Cyclopoida	70	14	86	1796	4528
Harpacticoida	24	34	10	0	0
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	24	14	76	6	20
Crustacean nauplii	192	0	6552	890	58
Cyprid	0	0	0	0	0
Amphipoda	4	0	0	0	204
Isopoda	0	0	2	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	8	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	2	0
Trochophore	0	0	102	0	0
Chaetognatha	0	2	0	0	36
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	42	43	44	45	46
Ballast Origin	Japan/ mid-Pacific	Oregon	Japan	Japan/ mid-Pacific	Japan/Korea/ Taiwan
Salinity (psu)	34	1	34	33	35
Temp (C)	25.5	4	17.7	12	17
Date Sampled (yyyymmdd)	19960828	19960828	19960906	19960909	19960910
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	0	0	0	10	0
Rotifera	0	0	0	0	0
Polychaeta	0	0	4	142	0
Bivalvia	0	0	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	2	572	0	0	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	0	620	0	0	8
Cyclopoida	2	2004	6	4	2
Harpacticoida	4	4	0	0	0
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	0	4	0	0
Crustacean nauplii	0	26	0	0	0
Cyprid	0	0	0	14	0
Amphipoda	0	0	2	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	2
Acarina	0	2	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	2	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	47	48	49	50	51
Ballast Origin	Japan	Japan	Japan	Japan/ mid-Pacific	China
Salinity (psu)	35	34	35	34	2
Temp (C)	18	18	17	18	14
Date Sampled (yyyymmdd)	19960910	19960911	19960911	19960912	19960913
Cnidaria (Hydra)	0	0	0	0	0
Medusa	0	0	0	0	0
Nematoda	0	0	0	62	0
Rotifera	0	0	0	0	0
Polychaeta	0	0	0	0	0
Bivalvia	0	0	0	0	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	3	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	0	0	0	0	0
Cyclopoida	0	0	2	7	4
Harpacticoida	0	0	2	69	0
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	0	0	0	0
Crustacean nauplii	0	0	0	0	0
Cyprid	0	0	2	0	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	0
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	0	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	0	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	0	0	0	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	52	53	54	55	56
Ballast Origin	San Francisco	Japan/ mid-Pacific	Japan/ mid-Pacific	Japan/ mid-Pacific	Japan/ mid-Pacific
Salinity (psu)	31	33	33	33	35
Temp (C)	15	12	16	9	9.4
Date Sampled (yyyymmdd)	19960918	19960926	19961001	19961021	19961113
Cnidaria (Hydra)	0	0	0	2	0
Medusa	0	0	0	0	0
Nematoda	0	2	0	2	0
Rotifera	0	0	0	0	0
Polychaeta	0	10	0	70	0
Bivalvia	0	0	0	2	0
Gastropoda	0	0	0	0	0
Cladocera	0	0	0	0	0
Ostracoda	0	0	0	0	0
Copepoda nauplii	0	0	0	0	0
Copepoda copepodites	0	0	0	0	0
Calanoida	0	38	0	106	2
Cyclopoida	0	1842	0	78	4
Harpacticoida	0	66	0	0	0
Monstrilloida	0	0	0	0	0
Copepoda - unaccounted	0	8	0	4	2
Crustacean nauplii	0	126	0	26	0
Cyprid	2	0	0	10	0
Amphipoda	0	0	0	0	0
Isopoda	0	0	0	0	2
Cumacea	0	0	0	0	0
Mysidacea	0	0	0	0	0
Decapoda pre-zoea	0	0	0	0	0
Decapoda zoea	0	0	0	6	0
Decapoda megalops	0	0	0	0	0
Acarina	0	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0	0
Thysanoptera	0	2	0	0	0
Chaoboridae	0	0	0	0	0
Trochophore	0	0	0	0	0
Chaetognatha	0	4	0	166	0
Larvacea	0	0	0	0	0

Table 3 (continued).

Sample No.	57	58	59	60
Ballast Origin	Japan	S. Korea	Japan/mid-Pacific/B.C.	Japan
Salinity (psu)	35	28	34	35
Temp (C)	9.4	4.4	5.5	6
Date Sampled (yyyymmdd)	19961114	19961120	19961120	19961121
Cnidaria (Hydra)	0	0	0	0
Medusa	0	0	0	0
Nematoda	0	0	0	0
Rotifera	0	0	0	0
Polychaeta	0	6	0	0
Bivalvia	0	164	32	0
Gastropoda	4	174	0	0
Cladocera	0	2	0	0
Ostracoda	0	86	0	0
Copepoda nauplii	0	0	0	0
Copepoda copepodites	0	0	0	6
Calanoida	60	900	182	0
Cyclopoida	2	116	2	6
Harpacticoida	0	194	8	2
Monstrilloida	0	0	0	0
Copepoda - unaccounted	0	64	80	0
Crustacean nauplii	18	726	4	0
Cyprid	2	0	0	0
Amphipoda	0	0	0	0
Isopoda	0	10	0	0
Cumacea	0	0	0	0
Mysidacea	0	0	0	0
Decapoda pre-zoea	0	0	0	0
Decapoda zoea	0	0	0	0
Decapoda megalops	0	0	0	0
Acarina	0	0	0	0
Collembola - Entomobryiidae	0	0	0	0
Thysanoptera	0	0	0	0
Chaoboridae	0	0	0	0
Trochophore	0	16	0	0
Chaetognatha	4	0	0	0
Larvacea	0	0	0	0

Table 3 (continued).

Sample No.	61	62	63
Ballast Origin	Japan	Japan	S. Korea/ mid-Pacific
Salinity (psu)	36	35	35
Temp (C)	8.8	5.5	7
Date Sampled (yyyymmdd)	19961130	19970107	19970108
Cnidaria (Hydra)	0	0	0
Medusa	2	0	0
Nematoda	0	4	0
Rotifera	0	0	0
Polychaeta	0	0	0
Bivalvia	2	0	0
Gastropoda	0	0	0
Cladocera	0	0	0
Ostracoda	0	0	0
Copepoda nauplii	0	0	0
Copepoda copepodites	0	0	12
Calanoida	226	2	42
Cyclopoida	0	0	16
Harpacticoida	26	0	6
Monstrilloida	0	0	0
Copepoda - unaccounted	0	0	18
Crustacean nauplii	850	0	2
Cyprid	0	0	14
Amphipoda	0	0	0
Isopoda	0	0	0
Cumacea	0	0	0
Mysidacea	0	0	0
Decapoda pre-zoea	0	0	0
Decapoda zoea	0	0	0
Decapoda megalops	0	0	0
Acarina	0	2	2
Collembola - Entomobryiidae	0	0	0
Thysanoptera	0	0	0
Chaoboridae	0	0	0
Trochophore	0	0	0
Chaetognatha	0	0	0
Larvacea	0	0	0

Table 4. Copepods identified from the ballast water of vessels sampled. Data are number of copepods•1000 L^{-1}, except for samples 2A and 12, which were sampled with plankton net, and sample 22, where only presence or absence was noted.

Sample No.	1A	1B	2A	2B	3	4	5
COPEPODA nauplii	0	0	0	0	0	0	0
COPEPODA copepodites	0	0	0	0	5	0	20
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	165	0	0	5	0	0	2
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	0	0	0	0	0	0	0
Calanus marshallae	0	0	0	0	0	0	0
Calanus pacificus	0	0	0	0	0	0	0
Centropages abdominals	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	10	0	0	0	0	0	0
Metridia sp.	0	0	0	0	5	0	0
Metridia lucens	0	0	0	0	10	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	0	0	0	0	0	0	0
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	40	29	0	5	10	0	0
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	0	0	0	0	0	0	20
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	0	0	0	0	0	0	0
CALANOIDA - unid.	5	0	0	0	0	0	0

Table 4 (continued).

Sample No.	1A	1B	2A	2B	3	4	5
CYCLOPOIDA							
Clausidiidae	25	0	0	0	0	0	0
Corycaeus sp.	0	0	0	0	0	0	6
Corycaeus anglicus	0	0	0	0	0	0	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	0	0	0	0	0	0	0
Oithonidae	0	0	0	0	0	0	6
Oithona sp.	0	0	0	0	0	0	0
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	110
Oithona similis	0	0	0	0	0	0	0
Oncaea sp.	0	0	0	0	0	0	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	29	0	0	0	0	24
CYCLOPOIDA - unid.	0	0	0	0	0	0	0
HARPACTICOIDA							
Canuellidae	5	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0
Tachidiidae	0	0	0	0	5	0	0
Tisbe sp.	0	0	0	0	0	1497	0
HARPACTICOIDA - unid.	0	0	2	5	0	0	0
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	15	0	0	5	0	0	14

Table 4 (continued).

Sample No.	6	7	8	9	10	11	12
COPEPODA nauplii	44	0	0	2	0	0	0
COPEPODA copepodites	0	0	85	0	0	0	0
CALANOIDA							
Acartia sp.	0	0	0	4	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	48	0	0	4	0	0	0
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	0	0	0	0	0	0	0
Calanus marshallae	0	0	0	0	0	0	0
Calanus pacificus	0	0	0	0	0	0	1
Centropages abdominals	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	4
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	6	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	2	0	0	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	35	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	8
Paracalanus parvus	0	0	5	0	0	0	0
Parvocalanus crassirostris	0	0	0	4	0	0	0
Pseudocalanus sp.	0	0	0	0	0	0	34
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	2	0	0	0	0	0	0
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	0	0	0	0	0	0	0
CALANOIDA - unid.	0	5	0	0	84	0	0

Table 4 (continued).

Sample No.	6	7	8	9	10	11	12
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	0	0	10	0	0	0	0
Corycaeus anglicus	0	0	10	0	0	0	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	16	5	10	2	0	104	2
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	0	0	0	4	0	0	173
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	1588	0	210	106	0	2273	0
Oithona similis	0	0	0	0	0	0	2
Oncaea sp.	0	0	25	0	4	0	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0	0	13	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	13	0
Tachidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	24	0	5	4	4	455	4
MONSTRILLOIDA	0	0	5	0	0	0	0
COPEPODA - unaccounted	434	0	15	38	0	26	28

Table 4 (continued).

Sample No.	13A	13B	13C	14	15	16	17
COPEPODA nauplii	0	0	10	0	0	0	0
COPEPODA copepodites	0	0	0	0	0	0	0
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	5	0	0	0	0	0	0
Acartia clausi	0	1050	10	0	12	0	0
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	0	0	0	10	0	0	0
Calanus marshallae	25	0	0	0	0	6	0
Calanus pacificus	60	10	0	2	0	2	0
Centropages abdominals	0	0	0	116	0	0	0
Clausocalanus lividus	5	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	5	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	0	0	0	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	0	0	5	0	0	0	0
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	0	0	0	0	0	0	0
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	28	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	0	0	0	2	8	4	0
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	65	0	0	0	0
Undinella sp.	0	0	0	0	0	0	0
CALANOIDA - unid.	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	13A	13B	13C	14	15	16	17
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	0	0	0	2	0	0	0
Corycaeus anglicus	0	0	0	0	0	0	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	5	20	90	96	164	16	0
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	0	0	0	668	0	0	0
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	0	0	545	0	0	0	0
Oithona similis	0	0	0	0	0	0	0
Oncaea sp.	0	5	0	8	2	0	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	10	0	0	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	2	0	0	0
Microsetella rosea	0	0	0	0	0	0	0
Tachidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	20	0	5	668	200	50	2
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	18	19	20	21	22	23	24
COPEPODA nauplii	0	0	0	0	-	0	10
COPEPODA copepodites	0	0	0	0	-	0	0
CALANOIDA							
Acartia sp.	0	0	0	0	-	0	6
Acartia californiense	2	0	0	0	-	0	0
Acartia clausi	0	0	67	3	-	0	6196
Acartia longiremis	0	40	0	0	+	776	0
Calanus sp.	0	0	0	0	+	0	78
Calanus marshallae	0	0	0	103	-	5	4
Calanus pacificus	0	0	0	13	-	0	26
Centropages abdominals	0	0	7	0	-	4	18
Clausocalanus lividus	0	0	0	0	-	0	0
Clausocalanus parapergens	0	0	0	0	-	0	0
Clausocalanus pergens	0	0	0	0	-	0	0
Ctenocalanus vanus	0	0	0	0	-	0	0
Diaptomus sp.	0	0	0	0	-	0	0
Euchaeta sp.	0	0	0	0	-	0	0
Eurytemora sp.	0	0	0	0	-	0	0
Eurytemora herdmani	0	0	0	0	+	0	0
Eurytemora pacifica	0	0	0	13	+	0	4
Metridia sp.	0	0	0	0	-	0	0
Metridia lucens	0	0	0	0	-	0	0
Metridia pacifica	0	0	0	0	-	0	0
Microcalanus pygmaeus	0	5	0	0	+	0	0
Neocalanus cristatus	0	0	0	0	-	0	0
Paracalanus parki	0	0	0	0	-	0	0
Paracalanus parvus	0	0	25	7	+	4	144
Parvocalanus crassirostris	0	0	0	0	-	0	0
Pseudocalanus sp.	0	135	0	0	+	27	0
Pseudocalanus minutus	0	0	0	0	-	0	0
Pseudocalanus newmani	0	0	0	0	-	0	0
Pseudodiaptomus sp.	32	0	0	0	-	0	0
Pseudodiaptomus marinus	0	0	0	23	-	0	14
Scaphlocalanus sp.	0	0	0	0	-	0	0
Scolecithricella minor	0	0	0	0	-	0	0
Tortanus discaudatus	0	0	0	0	+	4	0
Undinella sp.	0	0	0	10	-	11	0
CALANOIDA - unid.	0	0	0	0	-	0	0

Table 4 (continued).

Sample No.	18	19	20	21	22	23	24
CYCLOPOIDA							
Clausidiidae	0	0	0	0	-	0	0
Corycaeus sp.	0	0	0	0	-	0	0
Corycaeus anglicus	0	0	0	0	+	0	10
Cyclops sp.	0	0	0	0	-	0	0
Hemicyclops sp.	26	0	0	0	+	0	12
Oithonidae	0	0	0	0	-	0	0
Oithona sp.	0	0	0	0	-	211	722
Oithona atlantica	0	0	0	0	-	0	0
Oithona brevicornis	188	0	0	0	-	0	0
Oithona similis	0	0	0	0	-	0	0
Oncaea sp.	0	0	0	0	-	2	0
Oncaea borealis	0	0	0	0	-	0	0
Oncaea conifera	0	0	0	0	+	0	0
Oncaea prolata	0	0	0	0	-	0	0
Oncaeidae	0	0	0	0	-	0	0
CYCLOPOIDA - unid.	0	0	0	0	-	0	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	-	0	0
Microsetella sp.	0	0	0	0	+	0	0
Microsetella rosea	0	0	0	0	-	0	0
Tachdidiidae	0	0	0	0	-	0	0
Tisbe sp.	0	0	0	0	-	0	0
HARPACTICOIDA - unid.	34	0	0	17	+	91	920
MONSTRILLOIDA	0	0	0	0	-	0	0
COPEPODA - unaccounted	462	15	85	20	-	0	26

Table 4 (continued).

Sample No.	25	26	27	28	29	30	31
COPEPODA nauplii	0	0	0	0	0	0	0
COPEPODA copepodites	0	0	0	0	0	0	0
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	0	0	0	8	4	124	6
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	0	0	0	0	0	0	0
Calanus marshallae	0	0	0	0	0	0	0
Calanus pacificus	0	0	0	0	0	0	0
Centropages abdominals	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	0	0	2	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	0	0	0	0	0	16	0
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	0	0	0	0	0	0	0
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	0	0	0	4	0	24	0
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	0	0	0	0	0	0	0
CALANOIDA - unid.	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	25	26	27	28	29	30	31
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	0	0	0	0	0	0	0
Corycaeus anglicus	0	2	0	2	0	2	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	6	152	8	18	2	44	0
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	0	0	0	0	0	0	0
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0
Oithona similis	0	0	0	0	0	1296	0
Oncaea sp.	0	0	0	0	0	0	0
Oncaea borealis	4	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0	0	0	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0
Tachdidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	40	126	8	4	0	26	0
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	14	0	0	0	8	154	0

Table 4 (continued).

Sample No.	32	33	34	35	36	37	38
COPEPODA nauplii	0	0	0	0	0	0	0
COPEPODA copepodites	0	0	0	0	0	94	0
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	0	0	1338	18	0	20	0
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	2	0	0	0	0	0	0
Calanus marshallae	0	0	0	0	0	4	0
Calanus pacificus	0	0	0	0	0	0	0
Centropages abdominals	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	0	0	0	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	0	0	0	0	0	92	4
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	0	0	0	0	0	0	0
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	16	0	8	36	0	10	18
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	0	0	0	0	0	0	0
CALANOIDA - unid.	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	32	33	34	35	36	37	38
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	0	0	0	0	0	0	0
Corycaeus anglicus	0	0	0	0	0	32	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	0	0	2	0	0	4	0
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	0	0	22	10	0	28	12
Oithona atlantica	0	0	6	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0
Oithona similis	0	0	2	0	0	0	0
Oncaea sp.	0	0	0	0	0	6	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0	0	0	2
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0
Tachdidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	0	0	2	0	0	24	34
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	2	0	0	0	0	24	14

Table 4 (continued).

Sample No.	39	40	41	42	43	44	45
COPEPODA nauplii	18	2	0	0	0	0	0
COPEPODA copepodites	0	0	156	0	0	0	0
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	0	0	0	0	0	0	0
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	4	0	0	0	0	0	0
Calanus marshallae	0	0	0	0	0	0	0
Calanus pacificus	0	0	102	0	0	0	0
Centropages abdominalis	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	66	0	0	620	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	0	0	0	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	1628	0	0	0	0	0	0
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	2	0	598	0	0	0	0
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	0	0	0	0	0	0	0
Scaphlocalanus sp.	0	0	2	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	0	0	0	0	0	0	0
CALANOIDA - unid.	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	39	40	41	42	43	44	45
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	12	0	2	0	0	0	0
Corycaeus anglicus	70	0	0	0	0	0	2
Cyclops sp.	0	1796	0	0	1994	0	0
Hemicyclops sp.	0	0	4	2	10	4	2
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	0	0	4522	0	0	0	0
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0
Oithona similis	0	0	0	0	0	0	0
Oncaea sp.	4	0	0	0	0	0	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0	0	2	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	0	0	0
Microsetella rosea	0	0	0	0	0	0	0
Tachidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	10	0	0	4	4	0	0
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	78	6	20	0	0	4	0

Table 4 (continued).

Sample No.	46	47	48	49	50	51	52
COPEPODA nauplii	0	0	0	0	0	0	0
COPEPODA copepodites	0	0	0	0	0	0	0
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	2	0	0	0	0	0	0
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	0	0	0	0	0	0	0
Calanus marshallae	0	0	0	0	0	0	0
Calanus pacificus	0	0	0	0	0	0	0
Centropages abdominals	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	2	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	0	0
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	0	0	0	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	0	0	0
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	0	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	0	0	0	0	0	0	0
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	0	0	0	0	0	0	0
Pseudocalanus minutus	0	0	0	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	0	0	0	0	0	0	0
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	0	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	4	0	0	0	0	0	0
CALANOIDA - unid.	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	46	47	48	49	50	51	52
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	0	0	0	0	0	0	0
Corycaeus anglicus	0	0	0	0	3	0	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	2	0	0	2	0	2	0
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	0	0	0	0	0	0	0
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0
Oithona similis	0	0	0	0	0	2	0
Oncaea sp.	0	0	0	0	3	0	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	0	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0	0	0	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	65	0	0
Microsetella rosea	0	0	0	2	0	0	0
Tachidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	0	0	0	0	3	0	0
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	0	0	0	0	0	0	0

Table 4 (continued).

Sample No.	53	54	55	56	57	58	59
COPEPODA nauplii	0	0	0	0	0	4	0
COPEPODA copepodites	0	0	0	0	0	0	0
CALANOIDA							
Acartia sp.	0	0	0	0	0	0	0
Acartia californiense	0	0	0	0	0	0	0
Acartia clausi	0	0	2	0	12	0	0
Acartia longiremis	0	0	0	0	0	0	0
Calanus sp.	0	0	0	0	2	0	0
Calanus marshallae	0	0	0	0	0	0	0
Calanus pacificus	0	0	0	0	0	0	0
Centropages abdominals	0	0	0	0	0	0	0
Clausocalanus lividus	0	0	0	0	0	0	0
Clausocalanus parapergens	0	0	0	0	0	0	0
Clausocalanus pergens	0	0	0	0	0	0	0
Ctenocalanus vanus	0	0	0	0	0	0	0
Diaptomus sp.	0	0	0	0	0	0	0
Euchaeta sp.	0	0	0	0	0	2	2
Eurytemora sp.	0	0	0	0	0	0	0
Eurytemora herdmani	0	0	0	0	0	0	0
Eurytemora pacifica	0	0	0	0	0	0	0
Metridia sp.	0	0	0	0	0	0	0
Metridia lucens	0	0	0	0	0	0	0
Metridia pacifica	0	0	0	0	18	18	2
Microcalanus pygmaeus	0	0	0	0	0	0	0
Neocalanus cristatus	0	0	0	0	2	0	0
Paracalanus parki	0	0	0	0	0	0	0
Paracalanus parvus	0	0	2	0	2	22	92
Parvocalanus crassirostris	0	0	0	0	0	0	0
Pseudocalanus sp.	0	0	0	0	22	664	14
Pseudocalanus minutus	0	0	102	0	0	0	0
Pseudocalanus newmani	0	0	0	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0	0	0	0
Pseudodiaptomus marinus	38	0	0	0	0	0	54
Scaphlocalanus sp.	0	0	0	0	0	0	0
Scolecithricella minor	0	0	0	0	2	0	0
Tortanus discaudatus	0	0	0	0	0	0	0
Undinella sp.	0	0	0	0	0	0	18
CALANOIDA - unid.	0	0	0	2	0	0	0

Table 4 (continued).

Sample No.	53	54	55	56	57	58	59
CYCLOPOIDA							
Clausidiidae	0	0	0	0	0	0	0
Corycaeus sp.	0	0	0	0	0	0	0
Corycaeus anglicus	0	0	0	0	0	110	0
Cyclops sp.	0	0	0	0	0	0	0
Hemicyclops sp.	4	0	4	2	2	4	2
Oithonidae	0	0	0	0	0	0	0
Oithona sp.	1838	0	74	0	0	184	0
Oithona atlantica	0	0	0	0	0	0	0
Oithona brevicornis	0	0	0	0	0	0	0
Oithona similis	0	0	0	2	0	0	0
Oncaea sp.	0	0	0	0	0	4	0
Oncaea borealis	0	0	0	0	0	0	0
Oncaea conifera	0	0	0	0	0	0	0
Oncaea prolata	0	0	0	0	0	2	0
Oncaeidae	0	0	0	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0	0	0	0
HARPACTICOIDA							
Canuellidae	0	0	0	0	0	0	0
Microsetella sp.	0	0	0	0	0	2	0
Microsetella rosea	0	0	0	0	0	0	2
Tachdidiidae	0	0	0	0	0	0	0
Tisbe sp.	0	0	0	0	0	0	0
HARPACTICOIDA - unid.	66	0	0	0	0	194	6
MONSTRILLOIDA	0	0	0	0	0	0	0
COPEPODA - unaccounted	8	0	4	2	0	64	80

Table 4 (continued).

Sample No.	60	61	62	63
COPEPODA nauplii	0	0	0	0
COPEPODA copepodites	6	0	0	12
CALANOIDA				
Acartia sp.	0	0	0	0
Acartia californiense	0	0	0	0
Acartia clausi	0	0	0	8
Acartia longiremis	0	0	0	0
Calanus sp.	0	0	0	0
Calanus marshallae	0	0	0	0
Calanus pacificus	0	0	0	0
Centropages abdominalis	0	0	0	0
Clausocalanus lividus	0	0	0	0
Clausocalanus parapergens	0	0	0	0
Clausocalanus pergens	0	0	0	0
Ctenocalanus vanus	0	0	0	4
Diaptomus sp.	0	0	0	0
Euchaeta sp.	0	0	0	0
Eurytemora sp.	0	0	0	0
Eurytemora herdmani	0	0	0	0
Eurytemora pacifica	0	0	0	0
Metridia sp.	0	0	0	0
Metridia lucens	0	0	0	0
Metridia pacifica	0	0	0	0
Microcalanus pygmaeus	0	0	0	0
Neocalanus cristatus	0	0	0	0
Paracalanus parki	0	0	0	0
Paracalanus parvus	0	0	0	24
Parvocalanus crassirostris	0	0	0	0
Pseudocalanus sp.	0	0	2	6
Pseudocalanus minutus	0	0	0	0
Pseudocalanus newmani	0	0	0	0
Pseudodiaptomus sp.	0	0	0	0
Pseudodiaptomus marinus	0	0	0	0
Scaphlocalanus sp.	0	0	0	0
Scolecithricella minor	0	0	0	0
Tortanus discaudatus	0	0	0	0
Undinella sp.	0	0	0	0
CALANOIDA - unid.	0	226	0	0

Table 4 (continued).

Sample No.	60	61	62	63
CYCLOPOIDA				
Clausidiidae	0	0	0	0
Corycaeus sp.	0	0	0	0
Corycaeus anglicus	4	0	0	4
Cyclops sp.	0	0	0	0
Hemicyclops sp.	2	0	0	0
Oithonidae	0	0	0	0
Oithona sp.	0	0	0	12
Oithona atlantica	0	0	0	0
Oithona brevicornis	0	0	0	0
Oithona similis	0	0	0	0
Oncaea sp.	0	0	0	0
Oncaea borealis	0	0	0	0
Oncaea conifera	0	0	0	0
Oncaea prolata	0	0	0	0
Oncaeidae	0	0	0	0
CYCLOPOIDA - unid.	0	0	0	0
HARPACTICOIDA				
Canuellidae	0	0	0	0
Microsetella sp.	2	0	0	0
Microsetella rosea	0	0	0	0
Tachdidiidae	0	0	0	0
Tisbe sp.	0	0	0	0
HARPACTICOIDA - unid.	0	26	0	6
MONSTRILLOIDA	0	0	0	0
COPEPODA - unaccounted	0	0	0	18

Table 5. Seasonal data on number of vessels boarded and origin of ballast water.

Origin of Ballast Water	Dec 1995	Jan - Mar 1996	Apr - Jun 1996	Jul - Sep 1996	Oct - Dec 1996	Jan 1997	Total
NE Asia	1	18	7	17	11	4	58
NE Asia/mid-Pac	0	9	4	8	5	1	27
NE Asia/SE Asia	0	0	0	1	0	0	1
NE Asia/US West	0	0	0	0	1	0	1
NE Asia/US West/mid-Pac	0	0	0	1	0	0	1
NE Asia/mid-Pac/BC	0	0	0	0	1	0	1
SE Asia	0	1	0	1	1	0	3
SE Asia/mid-Pac	0	0	1	0	0	0	1
SE Asia/US West	0	0	0	1	0	0	1
Asia/mid-Pac	0	1	0	0	0	0	1
mid-Pac	0	41	22	35	55	14	167
BC	0	11	3	0	2	1	17
US West	0	8	1	13	4	0	26
US West/BC	0	1	0	0	1	0	2
US West/mid-Pac	0	0	0	0	0	1	1
S Amer	0	1	0	1	0	0	2
Europe	0	1	0	0	0	0	1
No Ballast	0	13	1	5	11	1	31
Unknown	0	6	0	0	4	0	10
Total number of vessels boarded	**1**	**111**	**39**	**83**	**96**	**22**	**352**

Table 6. Ballast capacity (MT -- metric tonnes) of vessels boarded (N = 274).

Origin of Ballast Water	Dec 1995 MT	N	Jan-Mar 1996 MT	N	Apr-Jun 1996 MT	N	Jul-Sep 1996 MT	N	Oct-Dec 1996 MT	N	Jan 1997 MT	N	Total MT
NE Asia	11,000	1	184,975	10	114,018	7	308,107	17	343,003	11	59,759	4	**1,020,908**
NE Asia/mid-Pac	0	0	150,437	5	135,526	4	126,017	8	95,617	5	1,276	1	**508,895**
NE Asia/SE Asia	0	0	0	0	0	0	16,155	1	0	0	0	0	**16,155**
NE Asia/US West	0	0	0	0	0	0	0	0	2,422	1	0	0	**2,423**
NE Asia/US West/mid-Pac	0	0	0	0	0	0	17,131	1	0	0	0	0	**17,132**
SE Asia	0	0	13,327	1	0	0	8,014	1	165,403	1	0	0	**186,747**
SE Asia/mid-Pac	0	0	0	0	11,179	1	0	0	0	0	0	0	**11,180**
SE Asia/US West	0	0	0	0	0	0	16,015	1	0	0	0	0	**16,016**
mid-Pac	0	0	253,824	15	461,543	22	762,049	35	993,797	56	260,566	14	**2,731,907**
BC	0	0	27,478	2	0	0	0	0	35,470	2	16,572	1	**79,524**
US West	0	0	33,802	4	6,625	1	203,676	13	41,182	4	0	0	**285,307**
US West/BC	0	0	0	0	0	0	0	0	21,947	1	0	0	**21,948**
US West/mid-Pac	0	0	0	0	0	0	0	0	0	0	16,891	1	**16,891**
S Amer	0	0	0	0	0	0	5,265	1	0	0	0	0	**5,266**
No Ballast	0	0	0	0	13,870	1	98,294	5	112,285	10	32,247	1	**256,712**
Unknown	0	0	0	0	0	0	0	0	57,334	3	0	0	**57,337**
Total	**11,000**	**1**	**663,843**	**37**	**742,761**	**36**	**1,560,723**	**83**	**1,868,460**	**94**	**387,311**	**22**	**5,234,349**

Table 7. Transit time (days) of vessels from different regions to B.C. ports where the vessels were boarded.

Last Port	N	Mean	Range	S.D.
Alaska	8	6.1	4-10	2.5
B.C. Coast	25	1.2	1-3	0.5
U.S. West	41	2.6	1-11	2.3
Mid-America	4	11.3	7-22	7.2
S. America	3	20.3	18-25	4.0
Japan	111	15.0	9-47	5.2
S. Korea	40	15.6	11-24	3.0
China	19	17.5	15-25	2.6
Southeast Asia	7	18.7	14-26	4.5
Africa	4	30.3	27-34	3.0